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SUPERSEDING
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MILITARY SPECIFICATION

LUBRICANT, INNER TUBE, AIRCRAFT TIRE

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification establishes the requirements for inner tube lubricant.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL

- RR-S-366—Sieves; Standard, for Testing Purposes
- PPP-B-601—Boxes, Wood, Cleated-Plywood
- PPP-B-621—Boxes, Wood, Nailed and Lock-Corner
- PPP-B-636—Box, Fiberboard

STANDARDS

MILITARY

- MIL-STD-129—Marking for Shipment and Storage

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or requests for proposal shall apply:

- UNIFORM CLASSIFICATION COMMITTEE
- Uniform Freight Classification Rules

(Application for copies of the above publication should be addressed to the Uniform Classification Committee, 202 Chicago Union Station, Chicago, Ill., 60606.)

3. REQUIREMENTS

3.1 Data. Unless otherwise specified in the contract or order, no data are required by this specification or any of the documents referenced in section 2 (see 4.6 and 6.2).

3.2 Material. The component raw materials shall be thoroughly mixed to produce a non-hygroscopic powder which will decrease the coefficient of friction between rubber-on-rubber and rubber-on-metal surfaces, and which is free from any ingredients that might be harmful to rubber or metal.

3.2.1 Composition. Unless otherwise specified, the composition shall be an equal mixture of talc and mica by weight.

3.3 Appearance. The lubricant shall be of uniform composition, free from lumps, grit, and extraneous material.

3.4 Adherence. The adherence of the lubricant shall be sufficient to retain a film on a vertical rubber surface.

3.5 Nonvolatile content. The nonvolatile content shall be not less than 98 percent.

3.6 Loss on ignition. The lubricant shall not fuse when heated at 1,400° F (760° C) for 4 hours. The loss in weight after 4 hours shall not exceed 7.5 percent by weight.

3.7 Coefficient of friction. The coefficient of friction of the lubricated rubber surfaces shall not exceed 0.5.

3.8 Reduction of tackiness. A film of lubricant between two rubber surfaces shall prevent the rubber surfaces from sealing together under a load of 5 pounds per square inch at 150° C (302° F) for 2 hours.

3.9 Fineness. The particle size shall be such that not more than 0.2 percent shall be retained on a No. 100 (149 micron) sieve and

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not less than 75 percent shall pass through a No. 325 (44 micron) sieve.

3.10 Lime content. The lime (CaO) content shall be not more than 4.0 percent.

3.11 Silica content. The silica content shall be not less than 44 and not more than 55 percent.

3.12 Workmanship. Workmanship shall be such as to assure compliance with the requirements of this specification and shall be of good quality.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections. All of the examinations and tests specified herein are classified as quality conformance inspections.

4.3 Sampling.

4.3.1 Inspection test samples. A sample of not less than 1 pound shall be taken from each lot. A lot shall consist of the material of one batch submitted for inspection at the same time.

4.3.2 Test panels. The following test panels shall be required for tests:

Number	Material	Size
2-----	Tubes; inner, aircraft pneumatic tire.	3 x 5 inches
4-----	Tubes; inner, aircraft pneumatic tire.	1 x 1 inch

The 3- by 5-inch panels shall have a 0.0625-inch hole centered on a line 0.25 inch from one end of the panel. The panels shall be cleaned by scrubbing with a bristle brush in a stream of water and dried at room temperature.

4.4 Examinations.

4.4.1 Examination of product. Samples selected as specified in 4.3.1 shall be examined

to determine that they are free from lumps, grit, and extraneous material.

4.4.2 Packaging, packing, and marking. Preparation for delivery shall be inspected to determine conformance to section 5.

4.5 Test methods.

4.5.1 Application of lubricant. An excessive amount of the lubricant shall be applied to one side of the rubber panel and spread completely over the surface with a spatula. Excess lubricant shall be removed by lightly tapping the edge of the lubricated panel which is held in a vertical position. Nonretention of the film on the vertical panel shall be cause for rejection.

4.5.2 Nonvolatile content. One gram of the sample shall be weighed in a wide mouth, short-weighing bottle provided with a glass stopper. With the stopper removed, the bottle shall be heated for 2 hours at 105° to 110° C (221° to 230° F). Then the stopper shall be inserted and after cooling, the bottle shall be weighed and the percentage of nonvolatile content calculated.

$$\text{Percent nonvolatile} = \frac{\text{wt. after heating}}{\text{wt. of original sample}} \times 100$$

4.5.3 Loss on ignition. A 1-gram sample shall be placed in a weighed crucible and heated in a muffle furnace for 4 hours at 1,400° F. Then it shall be removed from the furnace, cooled in a desiccator, and weighed. There shall be no apparent fusing of the compound.

$$\text{Percent loss on ignition} = \frac{\text{wt. loss on heating}}{\text{wt. of sample}} \times 100$$

4.5.4 Coefficient of friction. A thin layer of lubricant shall be applied to one surface of each of the 3- by 5-inch panels. One of the panels shall be clamped in a stationary position, lubricated side up, on a flat surface and the second panel shall be placed, lubricated side down, so that it overlaps the stationary panel over an area of 12 square inches with the holes at opposite ends. A standard kilogram weight, approximately 2 inches in diameter shall be placed on top of the panels, pressing them together; then a cord 1 to 2 feet in length shall be attached through the hole in the top panel. This cord shall be placed over a pulley which is placed so that the cord is held horizontally in

line with the panel until the pulley changes the direction; then weights shall be added to the free end of the cord until the lubricated surface of the top panel slides over the bottom panel.

Coefficient of friction

$$\frac{\text{wt. required to move one surface over the other}}{\text{wt. pressing the surfaces together.}}$$

4.5.5 Reduction of tackiness. A thin layer of lubricant shall be applied to one surface of each of four 1-inch-square panels. One square shall be placed on top of another with the lubricating film separating the surfaces of the square. The paired squares shall then be placed between two glass plates under a 5-pound load and heated in an oven at 302° F for 2 hours. Upon cooling, the surfaces of the rubber squares which were separated only by the lubricant shall show no evidence of sealing together.

4.5.6 Fineness. The No. 100 and No. 325 sieves (RR-S-366) shall be assembled with the No. 100 sieve on top, the assembly being completed by a solid collecting pan below the No. 325 sieve. Five grams of the sample shall be transferred to the top sieve and this sieve closed with a solid cover. The sample shall be passed through the sieves by subjecting it to agitation for 20 minutes. At the end of this period the collecting pan, containing the portion of the material passing the No. 325 sieve, shall be removed from the sieve assembly and the contents weighed. The collecting pan shall then be reassembled with the sieve as before, and the shaking continued for an additional 10 minutes. At the end of this additional shaking period, the collecting pan shall be removed and the contents weighed. If the additional material passing the No. 325 sieve during this second shaking period does not exceed 0.5 percent of the total weight of the sample, the sieve analysis shall be considered complete. If it does exceed 0.5 percent, the collecting pan and sieve shall be reassembled and shaken for successive additional 10-minute periods, weighing the material collected in the pan after each period of shaking, until the amount passing the No. 325 sieve in a 10-minute shaking period is less than 0.5 percent of the weight of the sample. The portion of the sample retained on each of the sieves and on the pan shall be carefully removed and weighed and the sum of

the weights shall be not less than 98 percent of the weight of the sample. Percentages shall be reported to the nearest 0.1 percent. Duplicate determinations by the same operator, using the same sieves, shall check within 1 percent of the total weight of the sample for the portion of the sample retained on each sieve and on the pan.

4.5.7 Lime content. A 1-gram sample shall be placed in a 250-ml. beaker, and 5 ml. of water and 10 ml. of 60 percent perchloric acid shall be added. The beaker shall be heated on a steam bath for 2 hours to complete the solution of the soluble material. The excess perchloric acid shall be fumed off, the last traces being removed by heating the wall of the beaker with a burner flame. After cooling, the salts shall be dissolved in about 20 ml. of water, and the silica filtered off and washed successively with small portions of hot water. To save time in evaporation, the volume of wash water should not exceed 50 ml. The solution shall be evaporated to 9 ml., and 1 ml. of dilute (1:4) sulfuric acid added, the solution cooled and 90 ml. of methanol added very slowly. After 1 hour at room temperature, the precipitated calcium sulfate shall be filtered through a weighed Gooch crucible and washed with 90 percent methanol. Then the crucible shall be dried at 230° F for 30 minutes and placed in a muffle furnace for 30 minutes at 400° to 500° C (750° to 932° F), cooled, and weighed.

$$\text{Percent CaO} = \text{wt. of residue} \times 41.19$$

4.5.8 Silica content. One-half gram of the moisture-free sample, 221° to 230° F. (105° to 110° C), shall be weighed into a platinum crucible; to this shall be added about 5 grams of powdered anhydrous sodium carbonate (Na_2CO_3). This shall be well mixed with a platinum wire. The mixture shall be covered with a little more Na_2CO_3 and heated gradually for about 1 hour until complete solution is obtained. Then a platinum wire with a coil on one end shall be immersed in the molten mass and both allowed to cool. The button shall be removed by gently heating the crucible until the outer surface of the mass has melted, allowing the button to be lifted out on the wire. Cool and then place in a beaker containing 30 ml. of hydrochloric acid (HCl) (1:1). The

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crucible and lid shall be cleaned with diluted HCl (1:4); this liquid shall also be added to the beaker. The material shall be allowed to digest for several minutes breaking up the solid matter with a stirring rod. Then the contents of the beaker shall be transferred to an evaporating dish, evaporated to dryness on a steam bath and baked for 1 hour at 230° F. Twenty to 30 ml. of HCl (1:1) and 50 ml. of hot water shall be added. When all salts have been dissolved, the solution shall be allowed to settle for several minutes and then filtered through a No. 40 Whatman paper, or equivalent. The silica (SiO₂) shall then be washed three times by decantation, first using 20 to 30 ml. portions of hot water, then HCl (1:1), then hot water again. The precipitate shall be transferred to the filter paper, removing all the SiO₂ from the dish. The paper and precipitate shall be washed several times with hot water. The small amount of SiO₂ remaining in the filtrate shall be recovered by evaporating to dryness, using the same procedure for baking and filtering as before. Then the two precipitates shall be combined, placed in a platinum crucible, and the paper burned off carefully to prevent any loss of SiO₂. The sample shall be ignited to constant weight at 1,100° to 1,200° C (2,012° to 2,192° F) (15 to 20 min.), cooled in a desiccator and weighed. The residue shall be moistened with several milliliters of water, and 10 ml. of hydrofluoric acid, and 3 or 4 drops of sulfuric acid added. The solution shall be evaporated to dryness, ignited carefully to prevent decrepitation and blasted for several minutes at 2,012° F (1,100° C). The crucible shall then be cooled in a desiccator, weighed, and blasting to constant weight repeated. The loss in weight from the original silica residue represents the SiO₂ content.

4.6 Reports of tests. The supplier shall furnish test reports, in duplicate, showing quantitative results for all tests required by this specification, and signed by the director (or his authorized assistant) of the laboratory in which the tests were conducted. (See 3.1 and 6.2.)

4.7 Rejection and retest. Where failure of a sample is definitely ascribed to faulty

material or fails to meet the applicable test requirements, the entire lot shall be rejected. Rejected inner tube lubricating compound shall not be resubmitted for approval without full particulars concerning previous rejection and measures taken to overcome the defects being furnished.

5. PREPARATION FOR DELIVERY

5.1 Preservation. Preservation requirements are not applicable to this specification.

5.2 Packaging.

5.2.1 Unit packaging. The compound shall be furnished in 1-pound units in a fiberboard-body metal top and bottom container. The container shall be of an oval shape not to exceed 2½ by 4½ by 6½ inches in dimension and shall be equipped with a pouring spout (similar in size and configuration to that of a common table-salt box) and a "friction plug" bottom or seamed metal end. The fiberboard shall have a minimum Mullen dry bursting strength of 275 pounds. The metal top and bottom shall be formed from minimum 32 gage (U.S. Standard Gage) tinplate.

5.2.2 Intermediate packaging. Unless otherwise specified, ten unit containers shall be placed in a fiberboard container conforming to PPP-B-636.

5.3 Packing. Unless otherwise specified, all items shall receive level B packing. Shipping containers shall contain the same number of unit packages, shall be uniform in size, and snugly packed.

5.3.1 Level A. Unless otherwise specified, exterior containers shall conform to PPP-B-601 or PPP-B-621. The gross weight of the fully packed exterior container shall not exceed 200 pounds.

5.3.2 Level B. Unless otherwise specified, exterior containers shall conform to PPP-B-636, except that fiberboard with a minimum Mullen test of less than 200 pounds shall not be used. The weight of contents of each box shall not exceed the limitations specified in PPP-B-636.

5.3.3 Level C. Unless otherwise specified, unit packages shall be overpacked in substantial commercial exterior containers constructed to insure acceptance by common or other carrier for safe transportation at the

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lowest rate to the point of delivery. Except as specified herein, the container shall conform to the requirements of Uniform Freight Classification Rules in effect at the time of shipment. Fiberboard, when used, shall conform to PPP-B-636 and have a minimum Mullen test of 200 pounds. Containers shall be able to withstand storage, rehandling, and reshipment without the necessity of repacking.

5.4 Marking. The marking of unit and exterior containers shall be in accordance with MIL-STD-129.

5.4.1 Additional marking. Unit containers shall be marked with the following:

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Contract or order number

Name of manufacturer

Date of manufacture

Name of supplier (if different from manufacturer)

Manufacturer's directions for use.

6. NOTES

6.1 Intended use. The material specified herein is intended for use as an inner tube lubricant in mounting aircraft tires.

6.2 Ordering data. Procurement documents should specify:

- (a) Title, number, and date of this specification.
- (b) Whether test reports should be furnished the procuring activity (see 3.1 and 4.6).
- (c) Applicable level of packaging and packing (see section 5).

Custodians:

Army—MO

Navy—WP

Air Force—(84)

Defense Supply Agency—CS

Reviewer activity:

Army—MO

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Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current Federal Supply Classification Listing of DoD Standardization Documents.